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Effect of ginger powder rhizome on humoral immunity of broiler chickens

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ABSTRACT

A study using 96 one-day-old Ross 308 broilers was conducted to assess the effect of ginger root powder (*Zingiber officinale*) on humoral immunity of broiler chickens. The birds were housed in 12 wire cages in an environmentally controlled room. Dietary treatments were no supplementation (control) and supplementation with ginger root powder at the levels of 5 g/kg and 10 g/kg of diet. Each group concluded 32 chickens and the experiment conducted with four replication for each 8 chickens in each group. On 9th, 23rd and 35th days of aviculture 6 chickens selected randomly from each group and their blood samples were taken to laboratory to conduct HI test (Prevention from Hemangontinasion) and obtained humoral immunity level recorded and studied: obtained results analyzed by statistical tests and observed that using ginger rhizome powder increased humoral immunity at 35th day.

Keywords: ginger, broiler, HI test, humoral immunity

INTRODUCTION

The fast growing nature of broilers and their short generation intervals has been associated over the years with the use of antibiotic growth promoters used as sub-therapeutic doses in animal feeds in order to improve the quality of the product, the essential compounds of ginger evaluated as natural alternatives to feed antibiotics in broiler diets [5]. Recently use of plant extracts as natural antioxidants has gained increasing interest because of the global trend of restriction in use of scientific substances [2]. Ginger has known as a medicinal herb [13]. Ginger (*Zingiber officinale* Roscoe, Zingiberaceae) rhizome (ginger root) is widely used as a spice or condiment [6] and medical treatment for certain diseases [4, 7, 12]. Ginger contains several compounds such as gingerol, gingerdiol, and gingerdione that possess strong antioxidant activity [8]. Ginger has a lot of useful effects on human and animals health such as anti-dyspepsia, anti-bloating, anti-vomiting and diarrhea and spasm. Ginger can increase digestion and can cure gastric problems. Information on the effect of ginger or its compounds on animal performance, antioxidant status, and serum metabolites, however, is lacking [15]. Poultry immunity divided into two parts: specific and non specific immunity and also humoral immunity is the main part of specific immunity and antibodies has the main role in its defiance system [11]. The objective of this study was to assess the effects of supplementations of ginger powder that were processed to different levels on humoral immunity of broiler chickens.

MATERIALS AND METHODS

Experimental Design, Birds, and Management:

ninety six 1-d-old vaccinated (Markes's disease and infectious bronchitis) Ross 308 broiler chicks (mixed sex) were obtained from a local commercial hatchery. Broilers were randomly allocated into 12 wire cages that were the randomly divided into 3 groups (treatments, 4 cages per treatment). Ginger (*Zingiber officinale*) rhizomes were

purchased from local markets. One of the Groups was fed basal diet only (control) and others were fed basal diet supplemented with ginger powder at the levels of 5 g/kg and 10 g/kg. The experiment was arranged as a factorial based complete randomized design and cages were used as replicate units. Broilers were fed a starter diet from d 1 to 12 and the grower diet from d 13 to 23 and the finisher diet from d 24 to 35. Diets were formulated to meet nutrient requirements for starter and grower and finisher broiler chickens and the diet compositions are shown in Table 1. All diets were prepared in one batch. Ginger powder were first mixed with premix that was subsequently mixed with other ingredients and then stored in covered containers before feeding. Birds were housed in an environmentally controlled room. The temperature was maintained at 32°C from d 1 to 7, which was then gradually reduced to 26°C at the rate of 3°C per week and was maintained at the temperature to the end of the experiment. Overhead light was provided continuously for the entire period of experiment. Birds were fed for ad libitum intake and had free access to water throughout the whole experiment. For investigation of humoral immunity and its commentary at days 9, 23 and 35 of age blood samples were taken from each of the pens and serum antibody titers of these chickens were measured against Newcastle vaccine by humoral immunity of hemagglutination inhibition (HI) test. The first time of blood sampling was done 1 day before vaccination B₁ Newcastle to determine the similarity of parent stock titer. The second and third time of blood sampling was done 2 and 3 week after vaccination B₁ to determine whether to be or not to be contaminated with virus Newcastle to prove the obtained titer of from each treatment. All sample blood of were justified the ratio by serologic procedure hemagglutination control test. Differences between means were considered significant at the 35th day by adding 10 g/kg rhizome powder at p<0.05.

Data Calculation and Statistical Analyses:

All data were subjected to ANOVA using the GLM procedure of SAS [10]. The data were first analyzed as a factorial based completely randomized design with individual cage as a random factor to examine the overall effect of treatments. Effect of ginger supplementation was determined by the complete random design. this effect was significant (i.e., P < 0.05). the significance of differences among treatments was tested using means with the Duncan option in SAS [10].

TABLE 1. Diet formulation and composition (%)¹

Items	Starter (0 to 12 d)	Grower (13 to 23 d)	Finisher (24 to 35 d)
Ingredients			
Corn	55.65	59.14	66.15
Soyben meal	38.63	33.57	28.80
Oil powder	1.5	3	2.05
Dicalcium phosphate	1.9	1.75	1.58
Sodium bicarbonate	0.03	0.22	0.26
Carbonate calcium	1.18	1.15	1.06
Vitamin-mineral premix	0.24	0.25	0.25
Salt	0.16	0.19	0.18
DI-Met	0.19	0.26	0.22
Lys	0.19	0.15	0.14
Calculated composition			
ME, kcal/ kg	2,980	2,970	3,000
CP%	21.67	19.8	17.85
Total phosphorous	0.142	0.465	0.422
Ca%	0.284	0.931	0.845
Na	0.165	0.152	0.15
Cl	0.165	0.156	0.15
Triptofane	0.294	0.283	0.245
Met+ Cys	1.054	0.9	0.81
Met	0.692	0.572	0.508
Lys	1.409	0.169	1.027
Multi enzyme	0.035	0.035	0.035

RESULTS

HI test:

The effect of ginger rhizome powder on humoral immunity (HI test) are shown in table 2. Results showed that at day 35 of age, ginger rhizome powder in 10 g/kg increased the HI titer compared to control and 5 g/kg diets (table 2). there were not statistically significant differences between treatments for HI titer at 9 and 23 days of age, there were no significant difference between different levels at 9 day of age. but at day 23 of age there was a significant

¹Control group was fed the basal diet. The other treatment diets were the same basal diet supplemented with ginger powder that was processed to different levels of 5 g/kg and 10 g/kg of a diet.

difference between 5 g/kg and 10 g/kg, in conclusion adding ginger rhizome powder in 10 g/kg improved humoral immunity of broilers at 35 day of age.

TABLE 2. Mean standard deviation, means (\pm SEM) and statistical comparison titers obtained in HI test

Ginger (g/kg)	9 th day	23 rd day	35 th day
0	2.400 \pm 0.212 ^a	3.120 \pm 0.375 ^{ab}	2.875 \pm 0.375 ^a
5	2.500 \pm 0.220 ^a	4.250 \pm 0.323 ^b	3.750 \pm 0.595 ^a
10	2.575 \pm 0.170 ^a	2.500 \pm 0.500 ^a	4.500 \pm 0.612 ^b

^{a-b} Mean values in the same columns with different superscripts are significantly different

DISCUSSION

Due to the use of 5 g/kg and 10 g/kg ginger rhizome powder in different days, adding 10 g/kg ginger rhizome powder can improve the immune response to NDV_{B1} vaccines. Tekeli *et al.*[13] observed that supplemental *Zingiber officinale* increased the number of lactic acid bacteria in the jejunum. Ademola *et al.*[1] observed that ginger at 1.0% caused significant decrease in white blood cells of chickens whereas Thayalini *et al.*[14] found that, higher lactic acid content was observed with the supplementation of ginger. Awang [5] observed that essential oils of ginger has a positive impact on the gut microflora. In contrast, Farhumand and Fazli [15] reported that adding ginger powder did not affect the titer of antibody against Newcastle disease. Nidaullah *et al.* [9] observed that aqueous extract of ginger rhizome mixed in water plays better performance as immune stimulant against ND, IB, IBD and Coccidiosis. Atiq and Durrani [3] observed that ginger aqueous extract have significant effect on the immune performance of broilers against IBD, IB and ND.

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